



SETI2021 VIRTUAL WORKSHOP

CONFERENCE PROCEEDINGS

*Hosted by Universidad de Concepción
and Duke University*



Universidad
de Concepción



NENRE - EFD - CHILE

Economía
Ambiental y de
Recursos Naturales

Duke

JAMES E. ROGERS
ENERGY ACCESS PROJECT

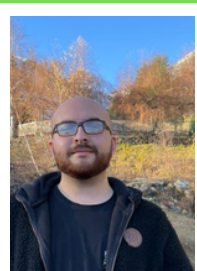
2021: A YEAR OF TRANSITION FOR SETI

On June 17-19, 2021, 301 attendees from all around the world gathered to discuss the main issues related to energy access, climate policy and economic development in the Global South. The virtual format of this year's conference allowed the participation of researchers, policymakers and practitioners from South and North America, Africa, Asia, Europe and Oceania, expanding our SETI community both in number and location, with almost 30% of presenters new to the SETI network.

This year's conference had nine research sessions to discuss the most relevant issues related to energy: energy transition, energy demand, cooking, electricity, air pollution, climate policy and gender, and two flash talk sessions. In addition, three policy sessions were held, including moderated discussions related to inclusive decarbonization in low- and middle-income countries, air pollution in Chile as an evaluation of the past and future perspectives, and gender mainstreaming in the energy transition. These sessions gathered important actors from policy and practice around the world, including speakers from WRI, UN Environment, the Chilean Ministry of Environment, and ESMAP, among others.

Author

Cristóbal Vásquez
Project Coordinator
SETI and EfD-Chile



These sessions were key to discuss the most relevant issues that need to be addressed now and in the future, but also demonstrated how to connect policymakers from all around the globe, including a policy session in Spanish with English interpreters.

This workshop was a result of the joint work between Duke University, SETI's steering committee and the EfD Chile center (at Universidad de Concepción, Chile). EfD Chile has now transitioned to manage the SETI collaborative and will be in charge of the administration of our vibrant and growing network!

These proceedings highlight the key themes that emerged from this year's conference.

Acknowledgements

We'd like to thank the Environment for Development (EfD) initiative and Duke Energy Access Project for supporting this conference. We'd also like to thank the Universidad de Concepción for hosting the conference and to the EfD Chile center for their logistical support.

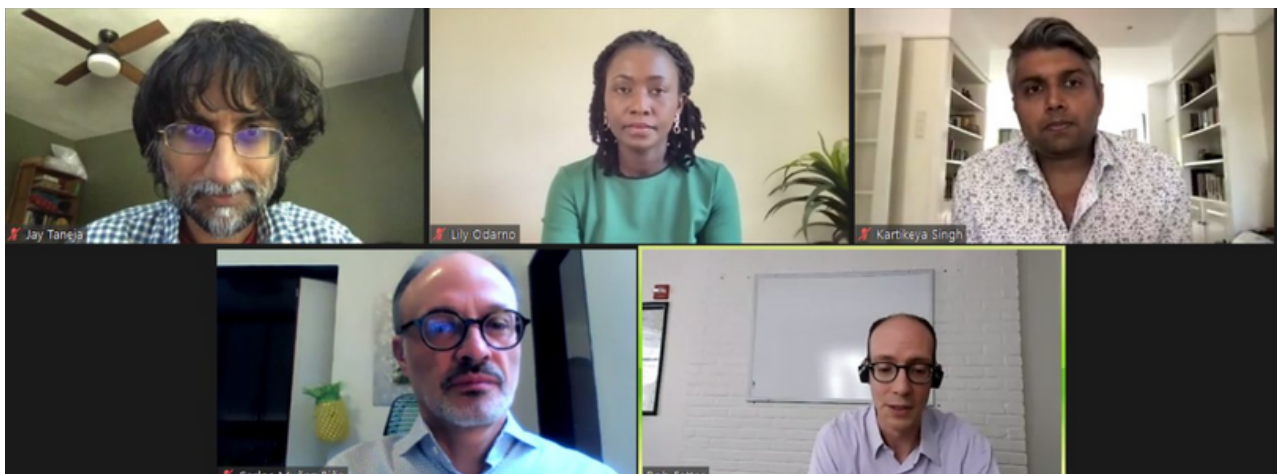
Policy sessions

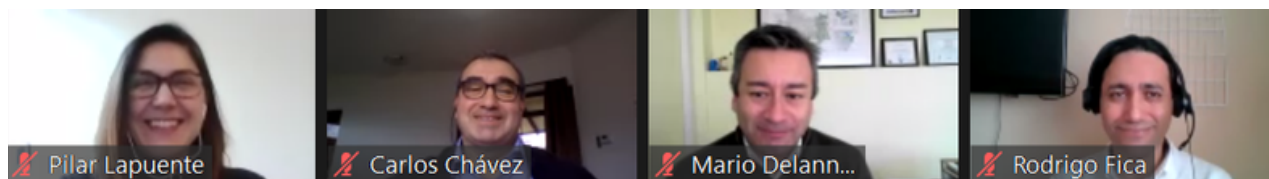
Green growth and inclusive decarbonization

The majority of future **global energy demand** is expected to come from developing economies, as they must meet the needs of their populations, adapt to the worsening effects of climate change, and provide reliable power for businesses and communities. Yet the imperative to decarbonize the global energy system requires unprecedented social and economic transformations. How can we reconcile the growing energy demands of developing economies with the need to decarbonize the global energy system? This panel, moderated by Rob Fetter (Duke University), brought a global group of experts to discuss institutional and financial innovations to support expanded access to reliable and affordable energy while also reducing carbon intensity, how inclusive decision-making can support equity within as well as between countries, and how international efforts can best support the actual needs of developing nations.

The panel included participation from Lily Odarno from Clean Air Task Force, Carlos Muñoz from WRI México, Kartikeya Singh from CSIS and SED Fund, and Jay Taneja from UMass Amherst.

Watch here





Watch here

Policy sessions

Air pollution and energy transition in Chile: Recent past and future perspectives

After many years of implementation of the **Atmospheric Decontamination Plan** (PDA) in Chile, we looked back to the past and discussed the main lessons learned from these policies. For this purpose, two members of the Chilean Ministerial Regional Service of Environment (SEREMI del Ministerio de Medio Ambiente) were invited to discuss how their offices have worked to implement the Plan from their own reality: Rodrigo Fica from Region of Maule and Mario Delannays from Region of Biobío, offered different views about the nature of air pollution and potential venues for energy transitions. Additionally, Pilar Lapuente from UN Environment shared with us the organization and planning for district energy in the Chilean context. This activity was moderated by Dr. Carlos Chávez (University of Talca, Chile).

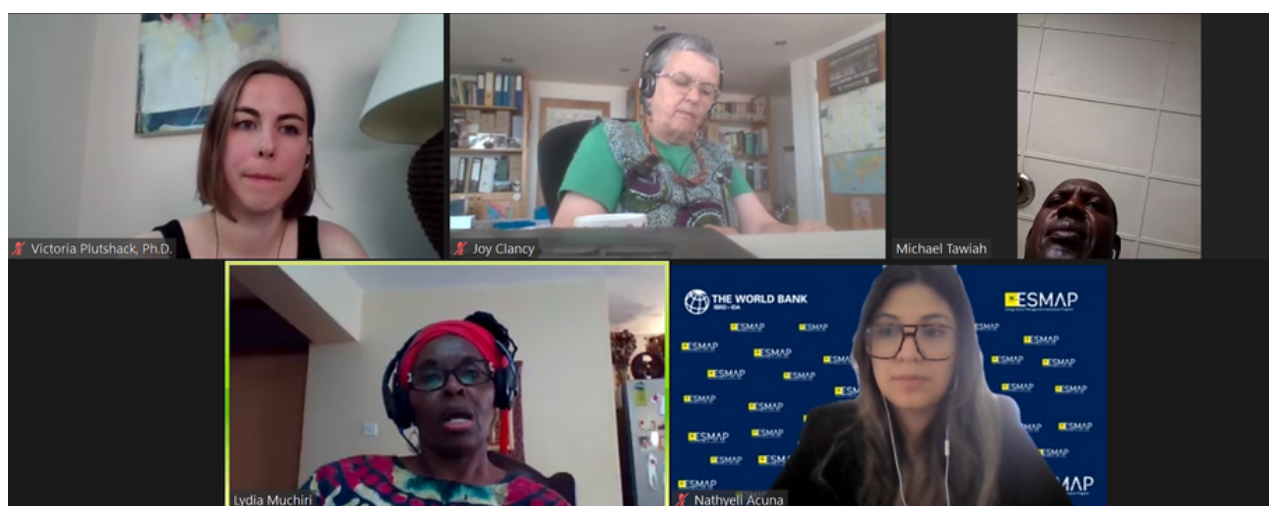
Policy sessions

Gender mainstreaming in the energy transition

Gender mainstreaming policies have been on the rise – in 2017, the Economic Community of West African States (ECOWAS) announced its regional Gender Mainstreaming in Energy Access Policy. In 2019, Kenya’s Ministry of Energy launched its own Gender Policy. Similar policies have been adopted in international development organizations. These policies seek to integrate women into the energy transition, rather than treat them solely as a beneficiary of clean, affordable energy. This panel, moderated by [Victoria Plutshack](#) (Duke University), brought researchers, policymakers and practitioners together to discuss what these policies look like, the challenges they face in implementation, and where researchers can plug in to add value.

The panel included Joy Clancy from ENERGIA, Nathyeli Acuña from ESMAP, Lydia Muchiri from Practical Action of Kenya, and Michael Tawiah from the Ministry of Energy of Ghana.

Watch here



Research sessions

01. Challenges in addressing air pollution from heating stoves in Chile, and the role of policy in the transition to cleaner technologies

One of the main topics discussed during this year's conference was related to air pollution and its determinants. Special focus was given to Chile, one of the most air polluted countries in Latin America.

According to Marcela Jaime, urban areas in the South are the main contributors to this problem and fuelwood plays a key role since it is used mainly in households for heating during winter. During her presentation, she indicated that fuelwood consumption increases with household income, family size, dwelling size, and the prices of other fuels such as kerosene. Additionally, consumption is related to multidimensional poverty (including factors of health, education and quality of life) and forest availability, lowering in those areas declared as PM2.5 saturated. Indeed, the availability of fuelwood appears to be relatively more important for wealthier households, where dwelling size is greater and demand is higher. In the case of low-income households, they are more perceptive to the problem when a zone is declared as saturated, and respond by reducing their consumption.

Air Pollution in Temuco (Chile)
by Walter Gómez from EFD Chile

Alejandra Schueftan also commented about this problem, indicating that the use of fuelwood has moved from cooking to heating between 1996 and 2019 and the energy transition is related to socioeconomic, cultural, demographic, and institutional factors. For example, in a survey applied to 150 households, they discovered a cultural attachment to the use of fuelwood: 28% of the respondents were not willing to change to cleaner energy sources because they “needed to see the flames in their stoves”.

From this behavioral perspective, César Salazar added to this issue indicating that people still do not perceive air pollution as a household-related problem. Actually, people believe that the main sources of air pollution are transport and industry. Moreover, lower-income individuals are less willing to accept regulatory instruments such as the fuelwood ban policy.

César also commented that to tackle this problem during the last decade, the Chilean Government has implemented regulatory instruments: declaring zones as saturated or latent according to the Atmospheric Decontamination Plan (PDA), implementing the critical episodes program (banning households from burning fuelwood), increasing technological and fuelwood standards, and giving economic incentives through subsidies (adoption of cleaner stoves, thermal insulation, light bulbs, and solar panels).



In terms of these policies, Adolfo Uribe explained that in particular the PDA, which has a cost of 85 million USD, has a stove-replacement program, where traditional stoves are replaced by cleaner options, mainly pellet stoves. However, the impacts of this policy are heterogeneous across income distribution: private benefits show that there is a 13% reduction of PM2.5 for high-income households who transitioned to pellet stoves, whereas low-income households reduced PM2.5 concentrations by 28%. This is a positive result that must be revisited, considering that even though comfort has increased through the stabilization of indoor temperature, poorer households still are affected by the high cost of pellets and deficient housing infrastructure.

02. The role of energy subsidies to improve social equity and the environment

During our workshop, many presenters indicated that access to electricity is key for low-income countries to reach equitable development. However, access challenges persist among households and industries.

In terms of electricity access, Ashish Sedai talked about electrification and the welfare effects for marginalized groups in India, highlighting that there are still socio-economic disparities in terms of caste. In particular, marginalized groups benefit from electrification, increasing their consumption levels, purchasing assets, and in consequence, transitioning out of poverty. Nevertheless, social inequalities must be considered when crafting policies, since electricity access and reliability is lower for marginalized groups when compared to high-caste groups.

Determinants of grid electricity demand in Ghana were also discussed from the perspective of power crises. Frank Adusah-Poku states that these crises historically have been driven by droughts (from 1983 until today), which are related to poor rainfall, gas supply challenges, and deteriorating electrical infrastructure of the country. His research indicates that in the long run, power crises and high prices have a negative and significant impact on electricity demand, reducing by about 27-32%, whereas the short run effect is smaller. As a result, industries may be reducing their reliance on electricity in favor of alternative fuels to insulate themselves from the negative consequences of potential power crises in the country. According to Frank, this emphasizes the need to channel electricity price subsidies into improving the infrastructure of power generation and distribution, in order to regularize electricity supply.

Electricity access for rural farms in Punjab (India) has contributed to ground-water depletion in the region. As Disha Gupta indicated during our workshop, Punjab is a very agricultural state. Indeed, in 1997, this state transitioned from a flat rate to a free farm electricity pricing system, which implied a differential increase in the number of electric-operated tubewells and the horsepower load of pumps, as compared to Haryana, a neighboring and similarly agrarian state. This study has important policy implications, considering that electricity subsidies in Punjab have encouraged intensive groundwater irrigation in the state, leading to the depletion of these resources to the extent that Punjab has the highest percentage of groundwater depletion with respect to its recharge in India.

03. Innovation in the energy transition: the role of storage in improving efficiency.

According to Siyu Feng, innovation is another key feature that must be considered in the electricity transition. In her presentation, she discussed the importance of electricity storage to keep renewables working, considering that these sources tend to be administered intermittently, have higher costs of storage, and lack capacity. Additionally, storage reduces ramping costs of conventional power plants, improving the efficiency of the electricity sector and avoiding blackouts. Using patent data from 1978 to 2019 across 1.881 regions, they documented the evolution in the storage of different technology types, showing that battery technologies still dominate innovation efforts, though fuel cells and flywheels present higher efficiency and storage capacity, respectively.

Moreover, when prices and past innovation experiences are included in the analysis, they find that the increase in the price of electricity leads to a reduction in the share of storage patents. Thus it is important to lower the cost of large-scale electricity storage in order to transform the energy sector through innovation and move towards a clean energy transition.

04. Fuel bans, tariffs, and regional-targets: the evidence on energy policy instruments.

Increasing population welfare and reducing pollution are important objectives for policymakers. However, when it comes to banning for the use of fuelwood (through mandate), the effects may be heterogeneous among the population.

During the workshop, Chenxi Xiang explained that even though fuel bans are a great tool to reduce polluting behaviors, such as using coal for heating and cooking, it might reduce the welfare of households, especially in low- and high-income groups that participate in the Heating Energy Transition Program in Beijing. Indeed, when the mandate is stricter, poorer households and those who are not willing to participate suffer more, because they are forced to change their energy type, and not compensated for their utility loss: Low-income households also reap fewer health benefits than high-income households, creating greater disparities from the policy.

Bishal Bharadwaj examines the role of policies to support energy adoption, highlighting the importance of geographically targeted subsidies in Nepal. Studying the implementation of Solar Home Systems (SHS) through the Renewable Energy Technology Subsidy Policy (RESP), he discovers that considering geographical aspects helps increase energy access in areas where it is much needed, especially for rural areas far from the national grid system. SHS adoption is also found to increase the probability of school completion at the standard age and improve women's employment as they spend more time working on farms and work longer hours.

This geographical perspective is also necessary for the Argentinian Patagonia, as Marcela Vanegas highlighted in her presentation. Due to the very cold climate of this region, policies on reducing biomass use should include energy vulnerability, the lack of thermal housing insulation, and fuel stacking. This is now of greater importance considering the negative effects of Covid-19 on the population, where heating in extremely cold zones is crucial for reducing other negative health effects.

Finally, Michael Hou reviewed the impacts of electricity tariff reforms in Africa that governments have at their disposal. Their main findings indicate that payment reforms, such as prepaid metering, may improve energy conservation because of increased awareness of consumption and careful household budgeting. However, structure reforms like Consumer Differentiated Pricing and Increasing Block Tariffs may have regressive effects on certain consumers, with low income households not capturing subsidies. Finally, rate reforms showed that price elasticities are inelastic and negative for all consumer types. Indeed low income households are often disproportionately affected by increases in prices, raising the need for parallel policies to mitigate negative effects on the poor.

05. Solar energy has positive effects on health, but information barriers may inhibit access

Nathaly Rivera explored solar energy expansion in Chile's Atacama Desert and evaluated health outcomes through two main mechanisms: first, if solar energy displaced coal-based power generation and, second if this displacement translates to better health outcomes. Her findings indicate that solar energy indeed displaces thermal plants, mostly coal-fired ones, and that this leads to fewer hospital admissions (around 13%) related to respiratory diseases in the short term. Indeed, in more populated areas, these effects are likely larger. However, it is also important to consider the limited healthcare infrastructure in Chile, since any reduction in hospitalizations can have a beneficial spillover effect in terms of increasing the number of hospital beds available.

Meera Mahadevan proposed another issue on the solar energy industry in India, arguing that information barriers may exist for households

to adopt solar energy technologies. As of December 2018, only 4GW of energy was provided in India by rooftop solar panels, which is related to high upfront costs, low willingness to pay for the service, and lack of financial services. In addition, customers may not know which products are suitable for their energy needs, largely dependent on household size. Applying a randomized experiment and intervening with smartphone applications, they discovered that access to information can increase the adoption of off-grid solar energy by as much as 15%, which makes this a cost-effective intervention when compared to subsidy policies. Moreover, they also increased consumer perception regarding sale agents' knowledge and confidence in solar products.

06. Empowered women are key for the transition towards clean energy

In many countries in the Global South, women are the primary individuals responsible for household energy acquisition and use, for example, when collecting fuelwood for cooking or heating. Added to this, many women are also responsible for child care. However, these responsibilities may limit women's role in society, considering that time spent collecting fuelwood (and other energy sources) may replace education or income generating activities.

To this end, Shivangi Jain explored how energy access can reduce this disparity between women and men and shed light on how households with more empowered women have higher adoption of clean energy devices in Myanmar, demonstrating the crucial role of women in the energy transition. In a context where 90% of the population still cooks with biomass, women spend over 20 hours monthly in the collection of fuelwood, and have lower labor force participation, Shivangi found that more empowered women were more likely to

use improved cookstoves as their primary cooking technology. Moreover, they had greater access to electricity, which is positively associated with greater independence of movement, as electrified communities provided women an improved sense of security.

However, the purchase of energy sources is still male-dominated. On this issue, Jennifer Meyer presented findings from a related study on LPG use in India, showing that men have greater mobility and ability to collect LPG cylinders compared to women. Thus, presenting evidence that energy access impact women and men differently.

One final point made by Mukti Nath Subedi is how Decentralized Energy Systems (DES) are beneficial for women living in remote rural areas in Nepal. Indeed, household access of micro-hydropower has a positive and significant effect on women's years of education, increasing in 1.01 years for women from lower castes. This result is also seen in terms of literacy, with an increase of 0.29 years.

07. Fuel stacking: a key challenge in the clean cooking transition

Between 2010 and 2018, the number of people without access to clean cooking in Sub Saharan Africa increased from 750 to 890 million people. Studying the case of Nairobi (Kenya) and Dar es Salaam (Tanzania), Ipsita Das found that while richer households in urban areas of Low and Middle Income countries adopt clean fuels for cooking at higher rates, low-income households in rural areas lack cooking access, exacerbating issues of indoor air pollution. Notwithstanding, fuel stacking (the use of multiple fuels) is still a widespread problem, and there is limited evidence on how fuel prices induce

this switching. Ipsita finds that there is higher willingness to pay among primary LPG-using households than primary charcoal-using households. Moreover, the LPG stacking proportion, measured as the energy content of LPG over the total amount of cooking fuels, is positively associated with household size, higher education levels of the household's head and cooking decision-maker, and household's savings. One important finding from this research is that households with a greater dependence on LPG fuels are more likely to accept an LPG price increase, which is important for the pricing of clean fuels, which can be adjusted via subsidies or taxes, and speed the transition toward clean fuels.

The issue of fuel stacking is prevalent in India, as presented by Dawit Guta. In this country, the use of solid fuel persists and clean stoves are used alongside polluting fuels. Between 2015 and 2018, he discovered that the use of LPG increased, although many households used solid fuels. He finds that the determinants of LPG use are related to convenience with cooking with LPG, familiarity with the technology, peer-learning, and education. However, the transition is affected by the cost of long-distance travel to refill LPG. To address this problem, pro-poor refill subsidies could be implemented to lower access costs for low income households.

Women cooking
by Martin Giant F Sumbayak





The Sustainable Energy Transitions Initiative (SETI) is an interdisciplinary global collaborative that aims to foster research on energy access and energy transitions in low- and middle-income countries and to better understand their impacts on health, social outcomes, economic growth, climate change, and natural resources. This “center without walls” is coordinated by Universidad de Concepción faculty Marcela Jaime and Duke University faculty Marc Jeuland, and is sponsored by the Swedish International Development Cooperation Agency through the Environment for Development Network.



The Research Nucleus on Environmental and Natural Resource Economics (NENRE) at Universidad de Concepción hosts the EFD Chile Centre and coordinates the activities of SETI during its second phase. NENRE is continuously working on energy projects, both in a research network and with the Chilean Government.